H_2 and Fuel Cell Activities at the California Air Resources Board

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California Air Resources Board

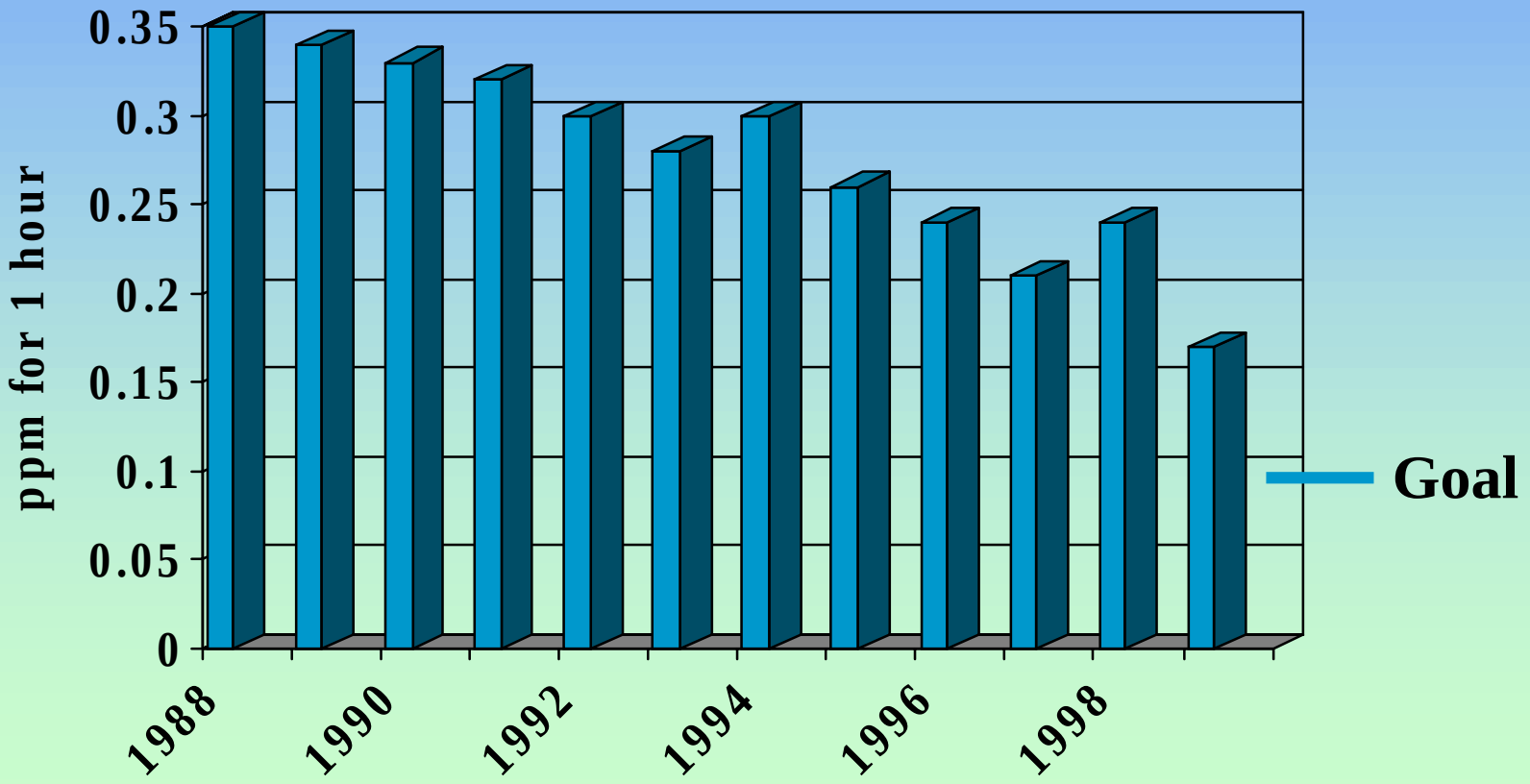
September 19, 2000

California Environmental Protection Agency

Air Resources Board

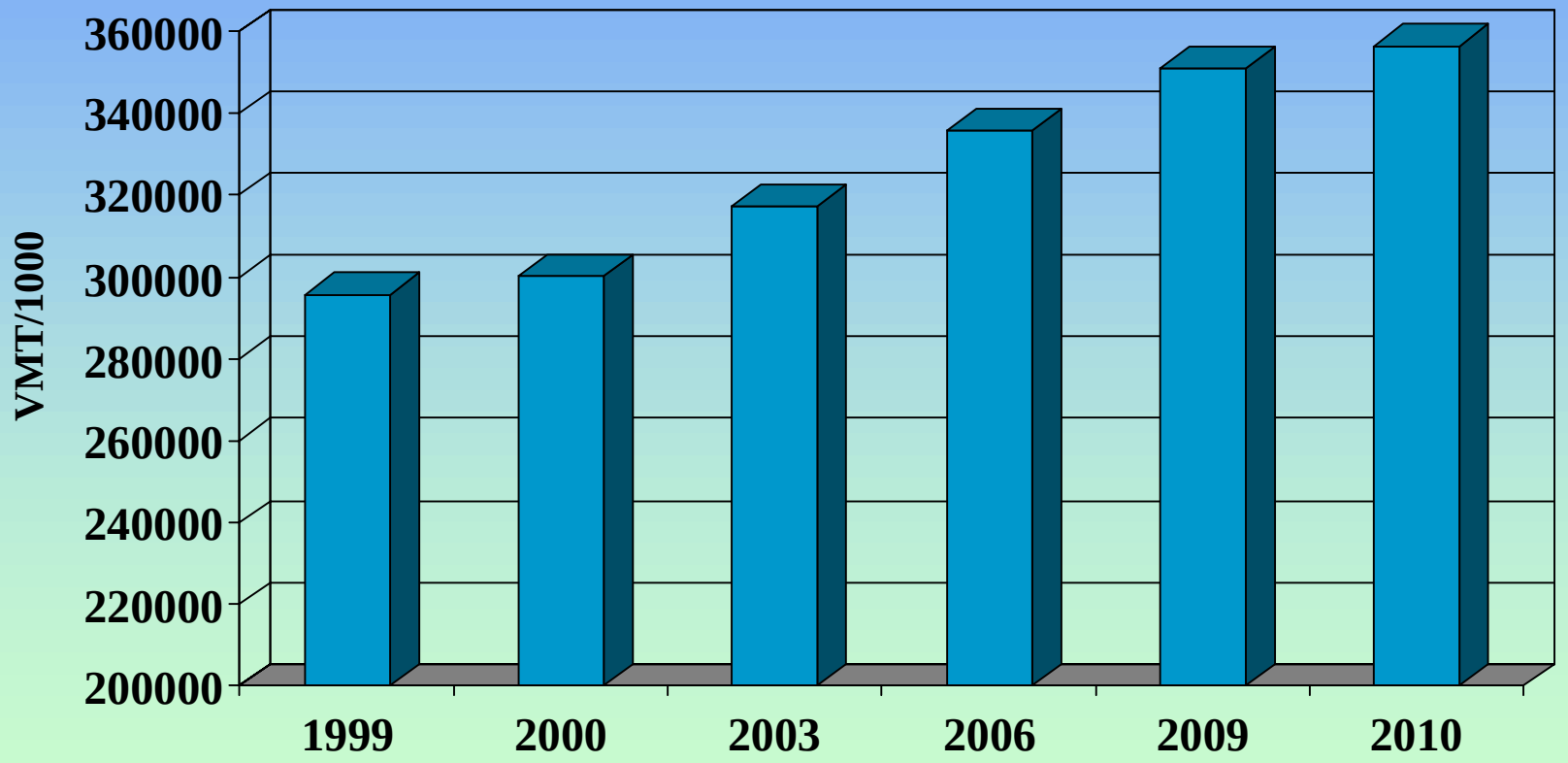
Air Quality Is Improving:

Highest Ozone: Greater Los Angeles



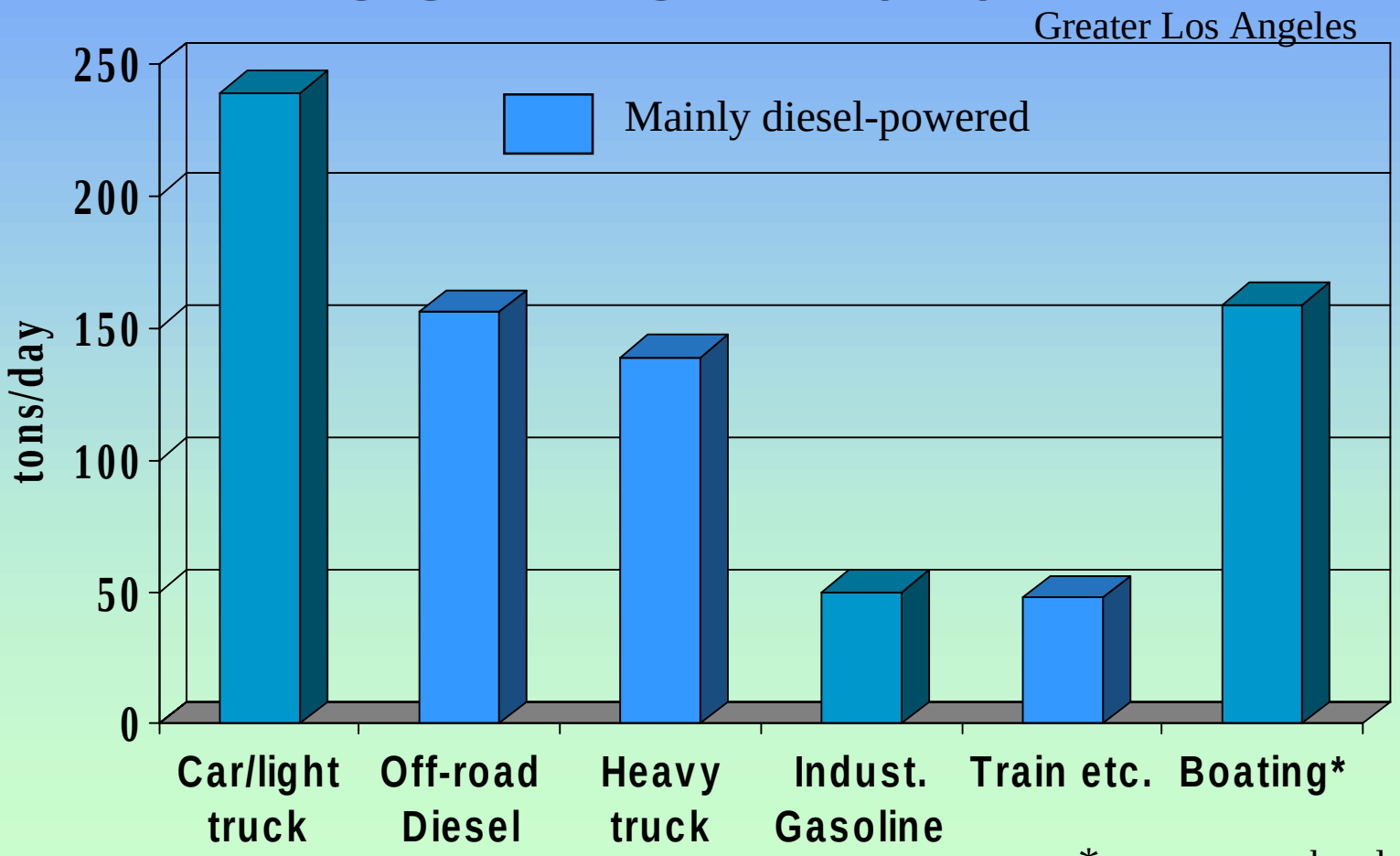
Vehicle Miles Traveled

(South Coast Air Basin)



Mobile Sources of Emissions

ROG + NOx: 2010

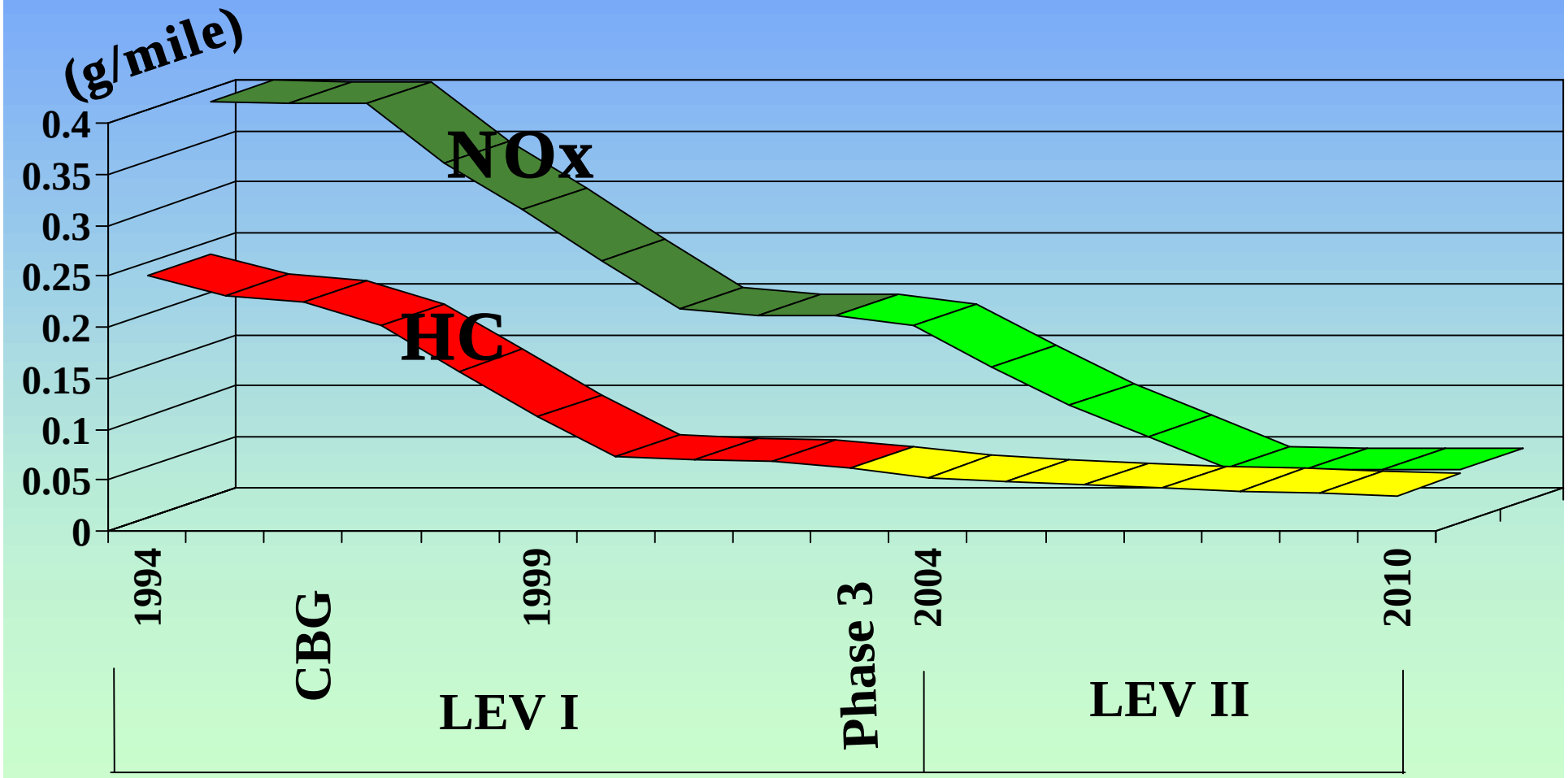


* summer weekend day

California's Motor Vehicle Programs

- **1990 LEV Program**
  - **required new, clean vehicles**
  - **established fleet-average standard**
  - **considered vehicle and fuel as a system**
- **Resulting technologies:**
  - **computerized fuel controls**
  - **fuel-injection systems**
  - **on-board diagnostics**
- **Development of ZEV technologies**

Goal is “Zero” Emissions



California's ZEV Program

- **Large manufacturers (7):**
  - **4% of car/light trucks in 2003+**
  - **~22,000/ year**
  - **battery electric, hydrogen fuel cell vehicles**
- **Additional 6% ZEV requirement**
  - **Super-clean gasoline engines, hybrids, etc.**
- **MOA: 1,800 advanced battery vehicles placed since 1996**

Emerging Technologies

- **Fuel cell electric vehicles**
  - **Development programs at all major manufacturers**
  - **Prototypes in 2000, commercial by 2004**
  - **Significant cost reductions needed**

Benefits of Fuel Cell Vehicles

- **Zero or near-zero emissions**
- **Potential for increased fuel efficiency and lower maintenance costs compared to conventional vehicles**
- **Allows the use of electric drive systems**
- **Provides extended range compared to battery-electric vehicles**

New Transit Bus Regulations will:

- **Reduce emissions of ozone precursors**
- **Reduce public exposure to toxic diesel particulates**
- **Support continuing use of alternative-fuel buses**
- **Encourage technology advancement**
- **Zero/near-zero emission transit buses**

Urban Transit Bus Regulation

- **New emission standards (low NOx and PM) and a fleet rule**
- **Transit buses ideally suited for alternative-fuels**
  - **in urban areas with poor air quality**
  - **centrally-fueled and maintained**
  - **purchases heavily subsidized**
  - **air quality incentive funds available**

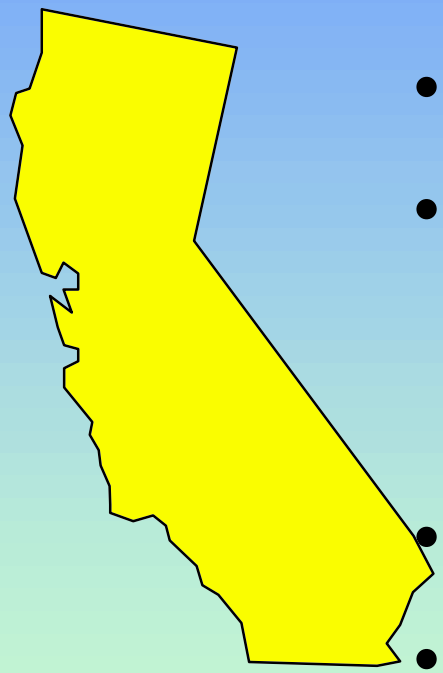
Alternative-Fuel Path

- **Alternative-fuel path provides immediate NOx reductions and greater overall PM reductions**
- **18 transit agencies already using alternative fuels**
- **85% of new purchases must be alternative-fuel**

ZEB Requirements

- **ZEB Demonstration Program**
  - **Applies to large transit agencies on diesel path**
  - **3 ZEBs in 2003 for fleets >200 buses**
- **ZEB Purchase Requirements**
  - **15% of new bus purchases (until 2015)**
  - **beginning in: 2008 for diesel path**
    2010 for alternative-fuel path

Why Are Fuel Cells Important to California?



- “Zero, Nada, Nothing, Zip”
- SIP to reduce emissions is based on technology, achievable emission reductions, and cost effectiveness
- High fuel efficiency and low emissions
- Fuel flexible

Future Challenges: Implementation

- Overcome technical hurdles
- Infrastructure for alternative fuels
- Gaining economies of scale (lower costs)
- Appropriate incentives
- Coupling global warming considerations to air pollution concerns

Vision

- Nearly all zero and near-zero emission vehicles
- Improved efficiency for lower CO_2 emissions
- Sustainable fuel supply: H_2 for fuel cells
- Clean, healthy air for everyone